Sustainability, Encroachment and Room to Maneuver (SERM) Program

USACE ENR Conference

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Construction Engineering Research Laboratory

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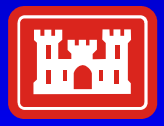
Email: annette.l.stumpf@erdc.usace.army.mil



Sustainable Planning: Ranges, Installations and Communities

May 2005

Annette Stumpf
U.S. Army Corps of Engineers Engineer Research and Development Center, Champaign, IL

Installation/Communities Partnering Plans
Assessment of Community Plan Impacts to Mission Activities
Assessment of Military Use Plans & Demands On Communities
Installation Planning Priorities

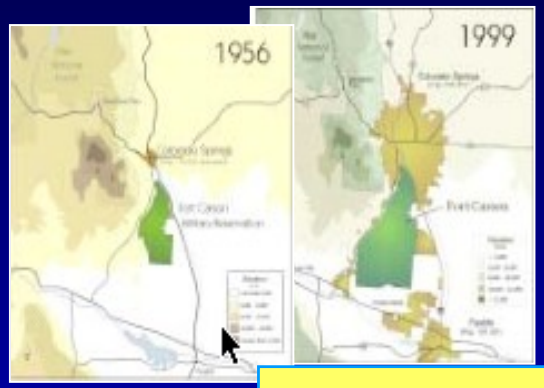
What is Really Important Today?

- Installations need assistance to engage their neighboring communities to protect future training opportunities

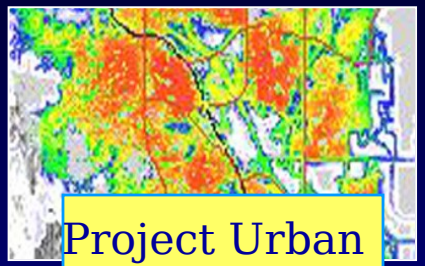
- ERDC / CERL has tools and expertise to help you support military installation long range planning

Sustainability, Encroachment and Room to Maneuver (SERM)

Land Use Change Assessment (LUCA™)



Conduct Trend Analy

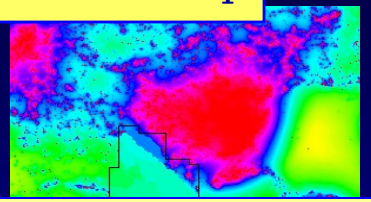


Project Urban Patterns

Land Evolution and Assessment Model (LEAM™)

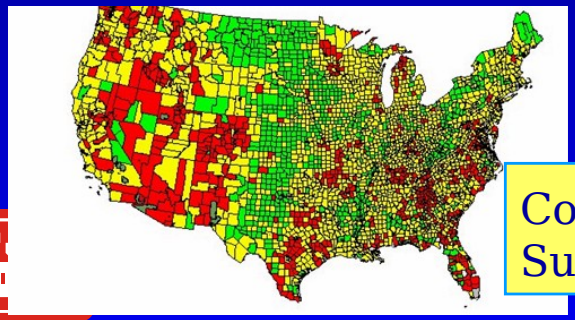
Quantify Mission Impacts

Military LEAM (mLEAM™)



Future Militar y Use = f (regional land use trends & policies)

Develop Collaborative Solu tions



SIRRA™

Compare & Assess Sustainability

PONDS™

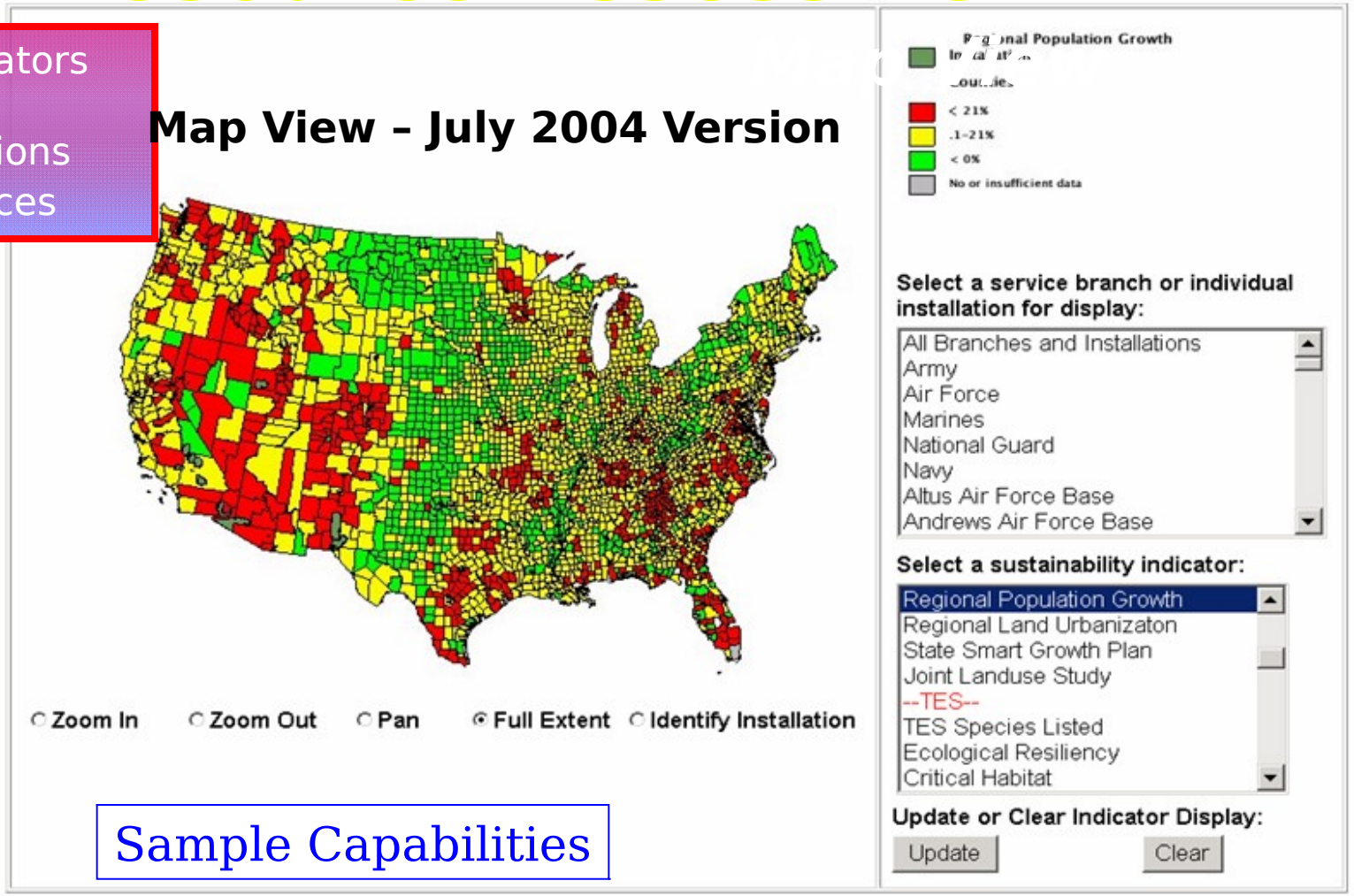
ponds
Proactive Options with Neighbors for Defense-installation Sustainability
Case Studies and Guidelines Data Base

US Army Corps of Engineers

Engineer Research and Development Center

SIRRA - Sustainable Installations Regional Resource Assessment

- 48 indicators
- 309 installations
- All services

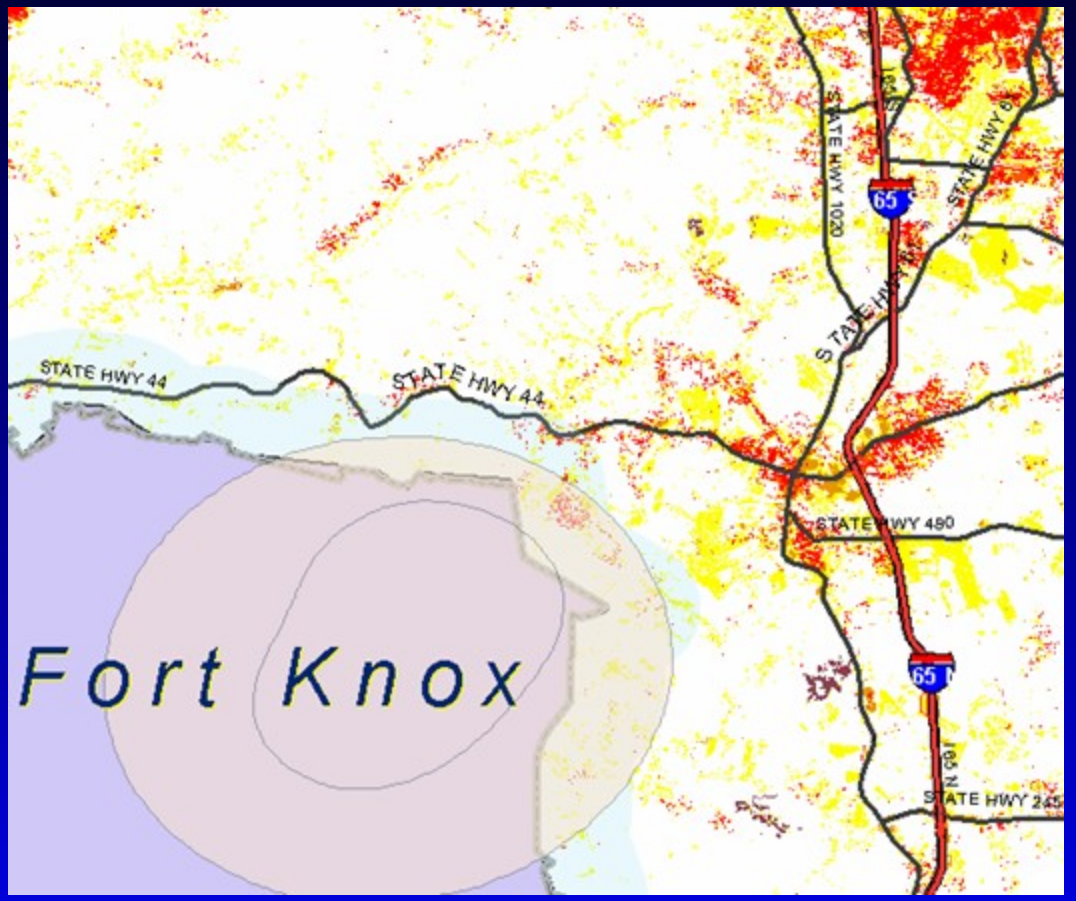


Sample Capabilities

Camp Pendleton Vicinity- Urbanizations

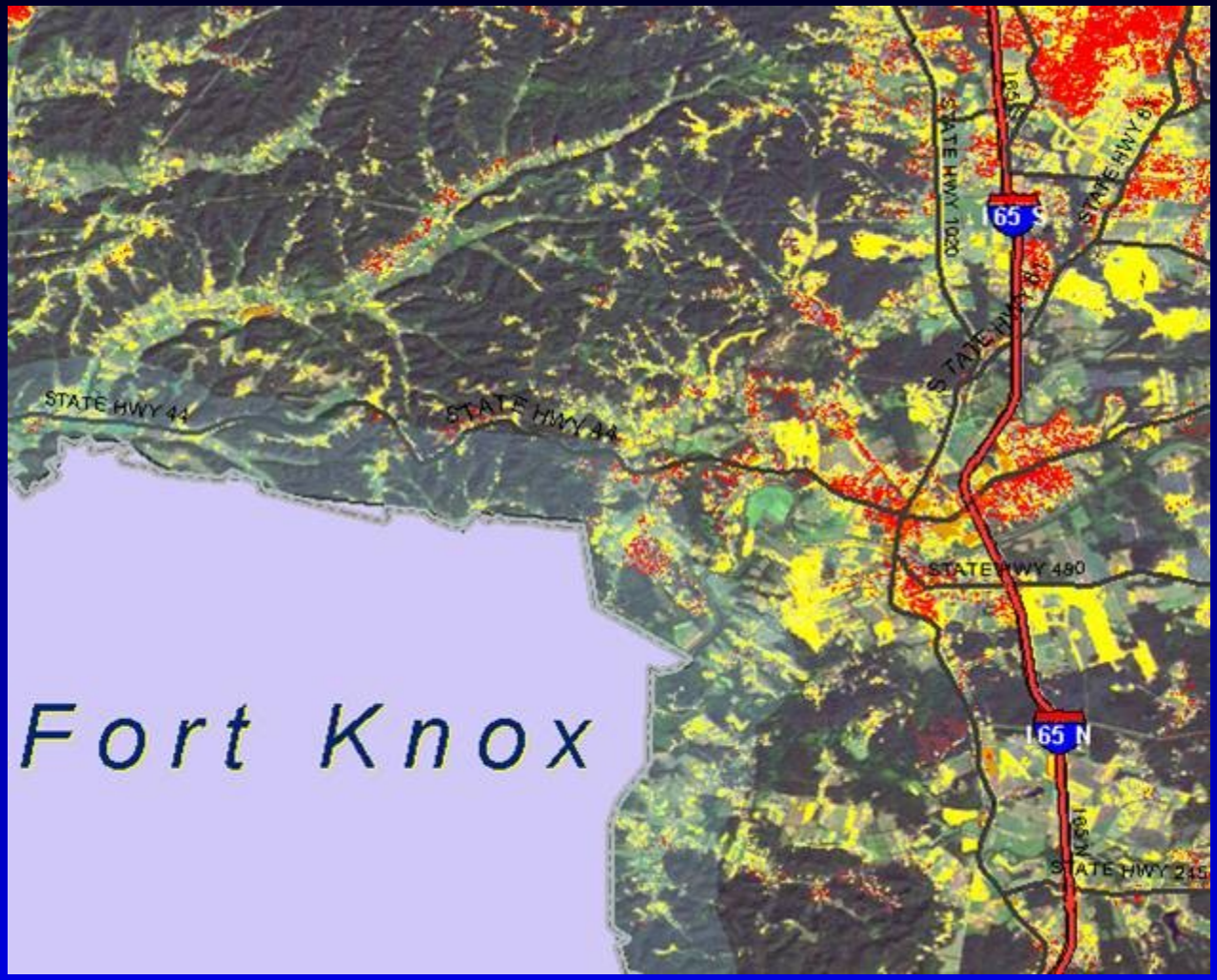
Urban Growth and Military Mission Impact

Here we have overlain the blast noise contours from a new range. High decibel levels go beyond the boundary and include many of the newly developed areas (yellow). Range usage will likely be limited to minimize disruptive impact to the public.



Growth of Development to 2001

On this map, red areas were urbanized in the 1992 National Land Cover Data (NLCD), and the yellow indicates additional urban areas identified in 2001 Ikonos Satellite image.



"© 1991Space Imaging LLC" $"Distribution and use restricted to DoD/Title 50 only"

Installation Perimeter Land Use Change Study

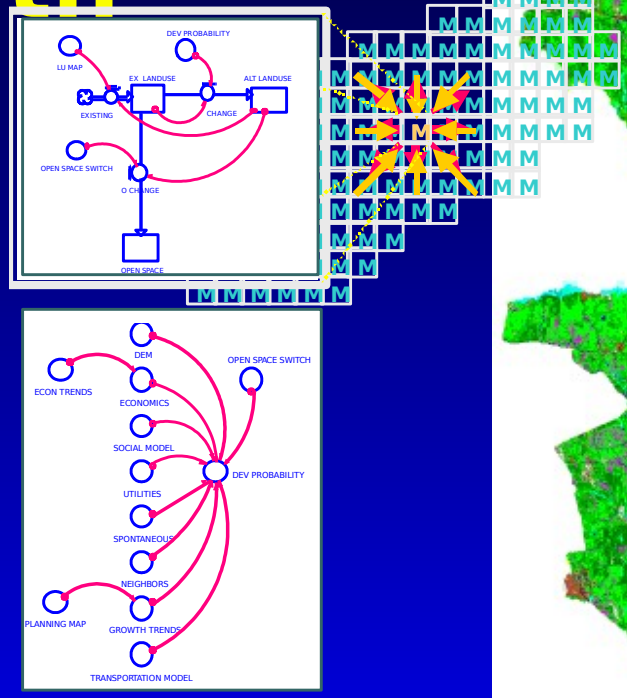
- 98 Installation Studied using NLCD – Ikonos comparison (all services)
- Work conducted by ERDC: CERL and CRREL. Sponsored by Army TABS office.
- Comparison of early 1990s land use land cover data with 2002-04 imagery
- Current average percent-developed urban land near military installations is :
  - 26% urbanization in 1 mile buffer
  - Standard deviation of 26% = high variation
- Average annual land use change rate (1 mile peri
  - 1% but as high as 3%
- 2020 Prediction: 35-38% urbanization of 1 mile perimeter

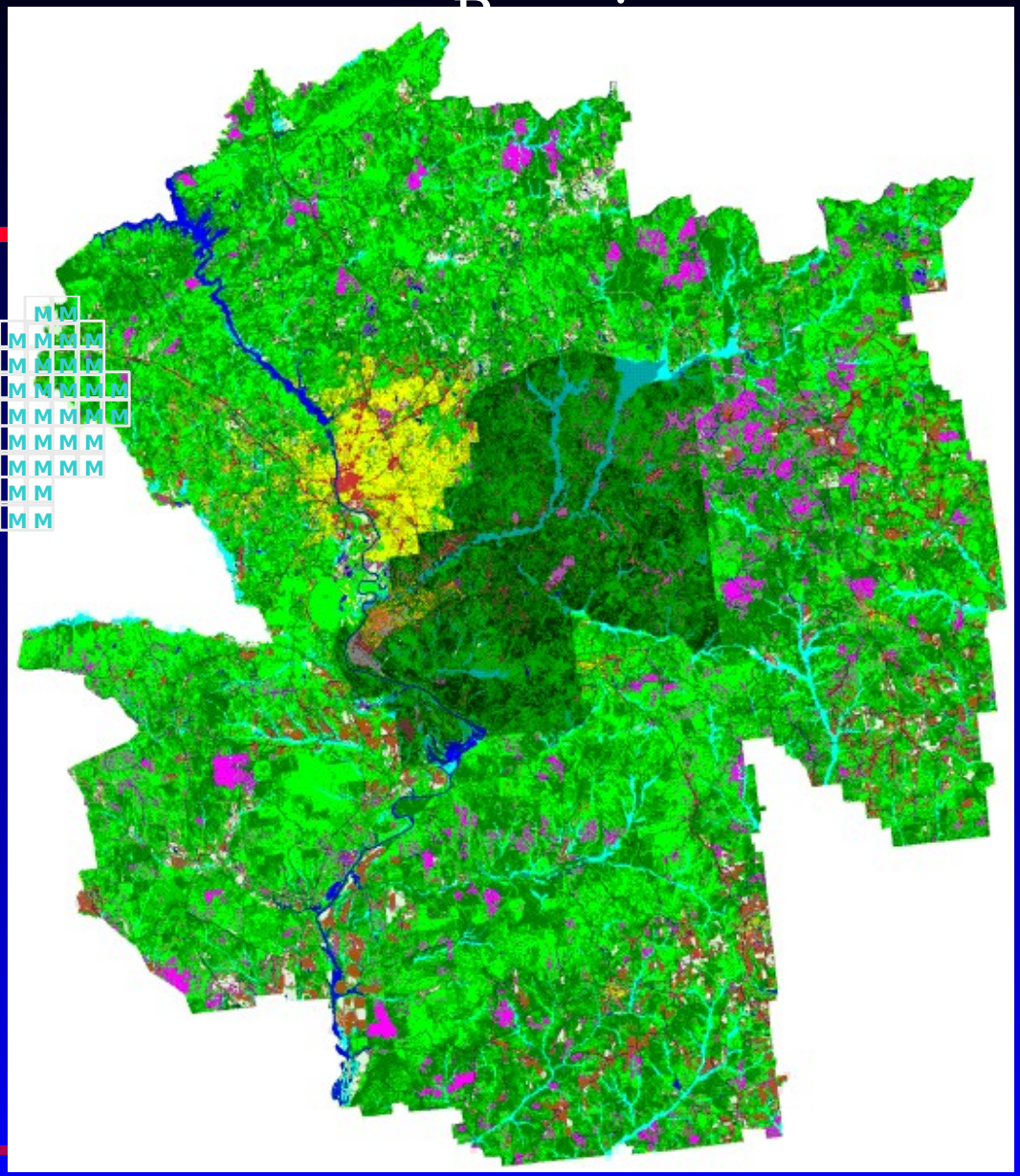
Perimeter Land Use Trend Analysis

Projected Urban Growth

Columbus/Ft

Land Evolution & Assessment Model (LEAM)

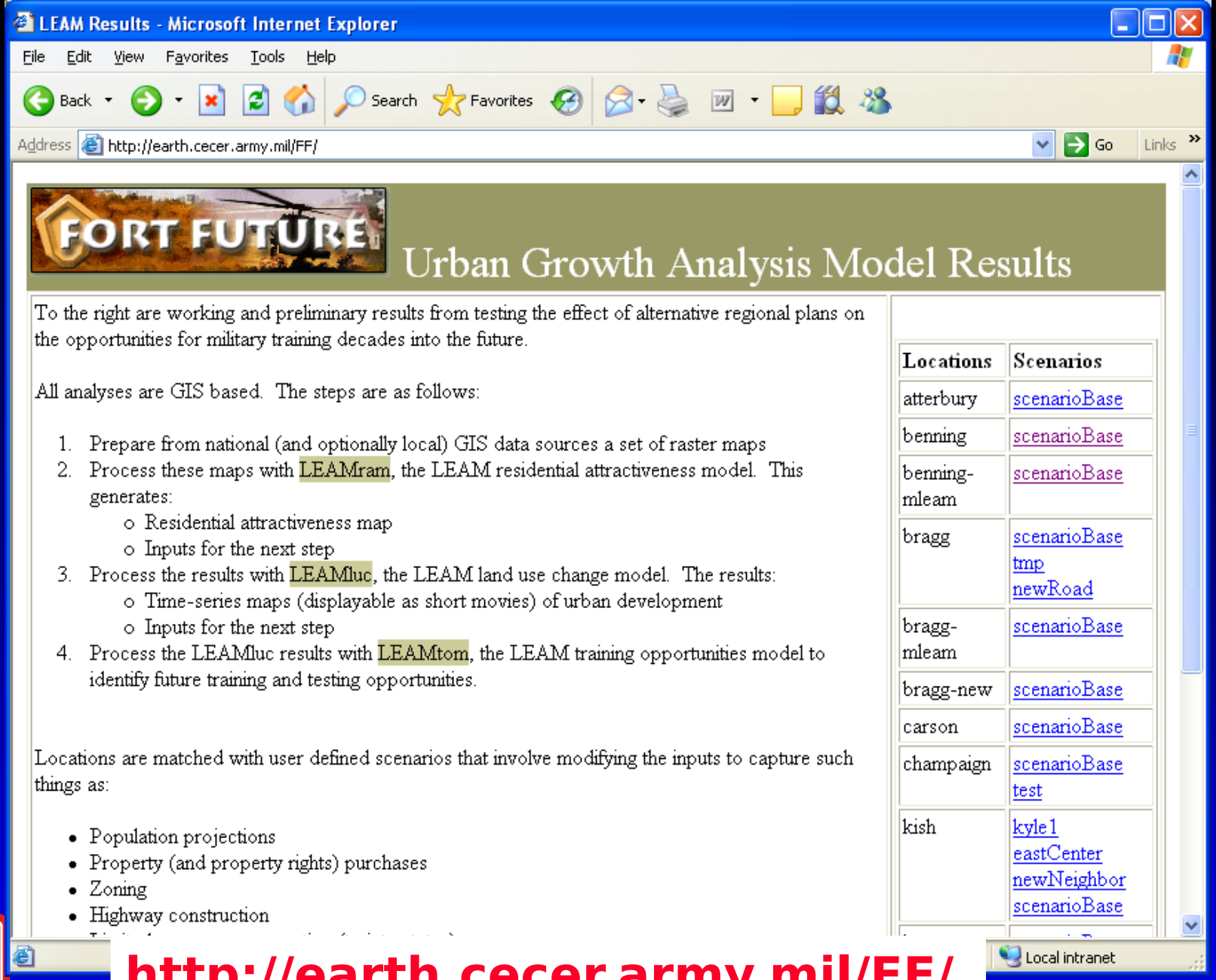




Project Future Changes

1993-2050

Engineer Research and Development


LEAM Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://earth.cecer.army.mil/FF/
Go Links
FORT FUTURE
Urban Growth Analysis Model Results
To the right are working and preliminary results from testing the effect of alternative regional plans on the opportunities for military training decades into the future.
All analyses are GIS based. The steps are as follows:
1. Prepare from national (and optionally local) GIS data sources a set of raster maps
2. Process these maps with LEAMram, the LEAM residential attractiveness model. This generates:
o Residential attractiveness map
o Inputs for the next step
3. Process the results with LEAMluc, the LEAM land use change model. The results:
o Time-series maps (displayable as short movies) of urban development
o Inputs for the next step
4. Process the LEAMluc results with LEAMtom, the LEAM training opportunities model to identify future training and testing opportunities.
Locations are matched with user defined scenarios that involve modifying the inputs to capture such things as:
• Population projections
• Property (and property rights) purchases
• Zoning
• Highway construction
Locations
Scenarios
atterbury
scenarioBase
benning
scenarioBase
benning-mleam
scenarioBase
bragg
scenarioBase
tmp
newRoad
bragg-mleam
scenarioBase
bragg-new
scenarioBase
carson
scenarioBase
champaign
scenarioBase
test
kish
kyle1
eastCenter
newNeighbor
scenarioBase
Local intranet

http://earth.cecer.army.mil/FF/

US Army Corps of Engineers

Engineer Research and Development Center

Urban Growth Simulation Model Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://earth.cecer.army.mil/FF/knox-new/prop_roads/ Go Links

FORT FUTURE

Urban Growth Analysis Model Results

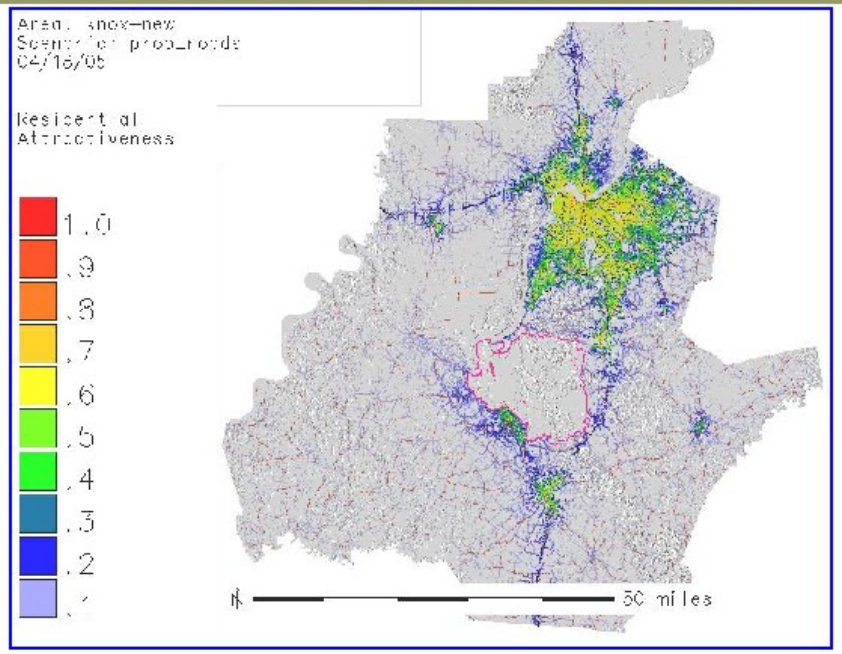
Location: knox-new

Scenario: prop_roads

Date: Wed Apr 20 16:49:15 CDT 2005

Operator: Kyle Brock

This simulation model is powered by the mLEAM suite of tools, part of Fort Future.



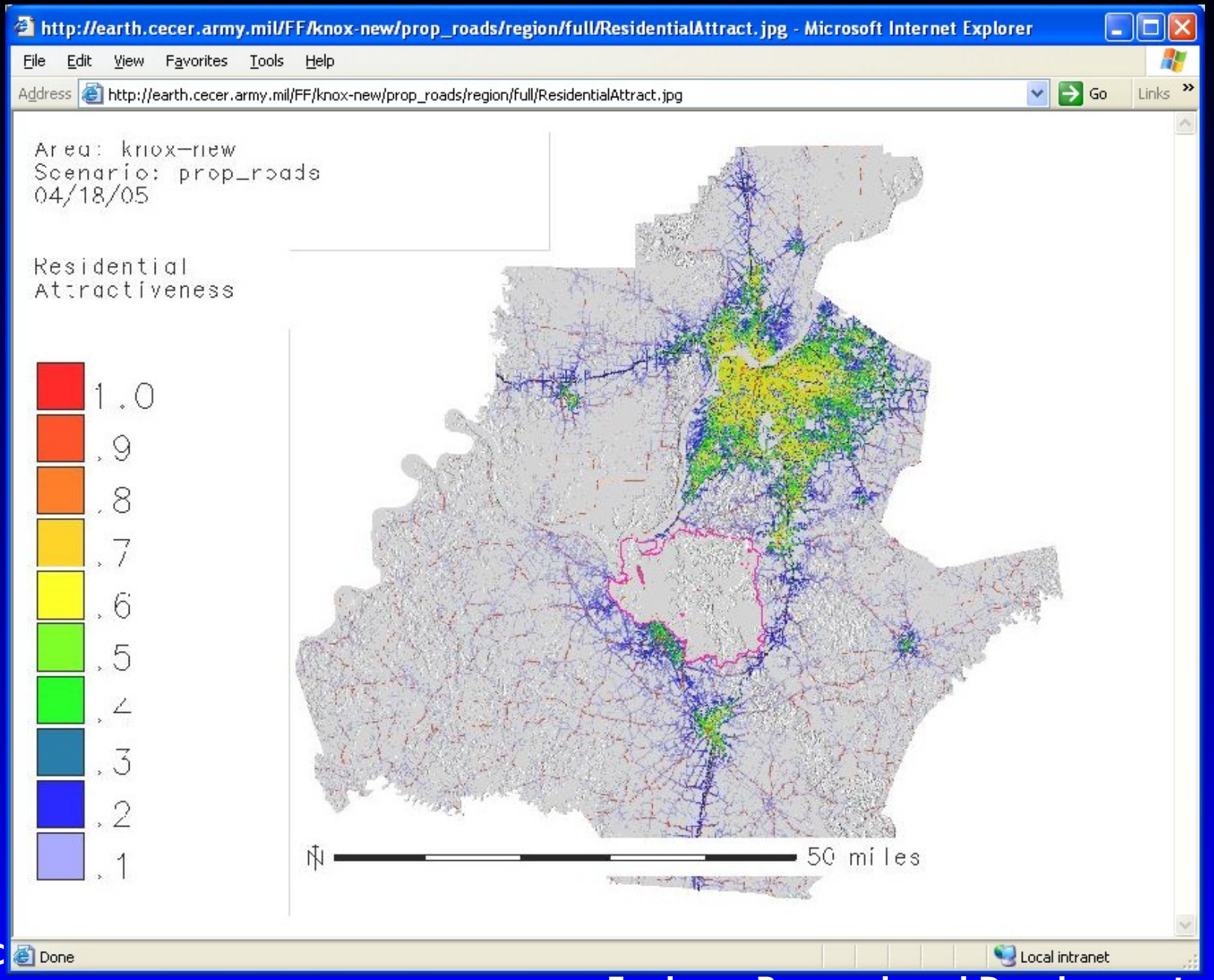
Available Results

Residential attractiveness maps

These maps represent the residential attractiveness for the area at the beginning of the study period. (A small version is displayed above.) The scale is an index using a rainbow color table. The index represents a percentage of similar developable lands that were developed into residential as indicated in the National Land Cover Data (NLCD) map used in the analysis. For example, in the NLCD map, 60% of all yellow cells (value of about .6) were residential, 40% of all green (value of about .4) were developed, and so on. The assumption is that future development is more likely to occur in areas that have a higher probability of already being developed.

Local intranet

http://earth.cecer.army.mil/FF/


http://earth.cecer.army.mil/FF/knox-new/prop_roads/region/full/ResidentialAttract.jpg - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://earth.cecer.army.mil/FF/knox-new/prop_roads/region/full/ResidentialAttract.jpg
Go
Links
Area: knox-new
Scenario: prop_roads
04/18/05
Residential
Attractiveness
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
N
50 miles
Done
Local intranet

PONDS

Proactive Options with Neighbors for Defense installation Sustainability

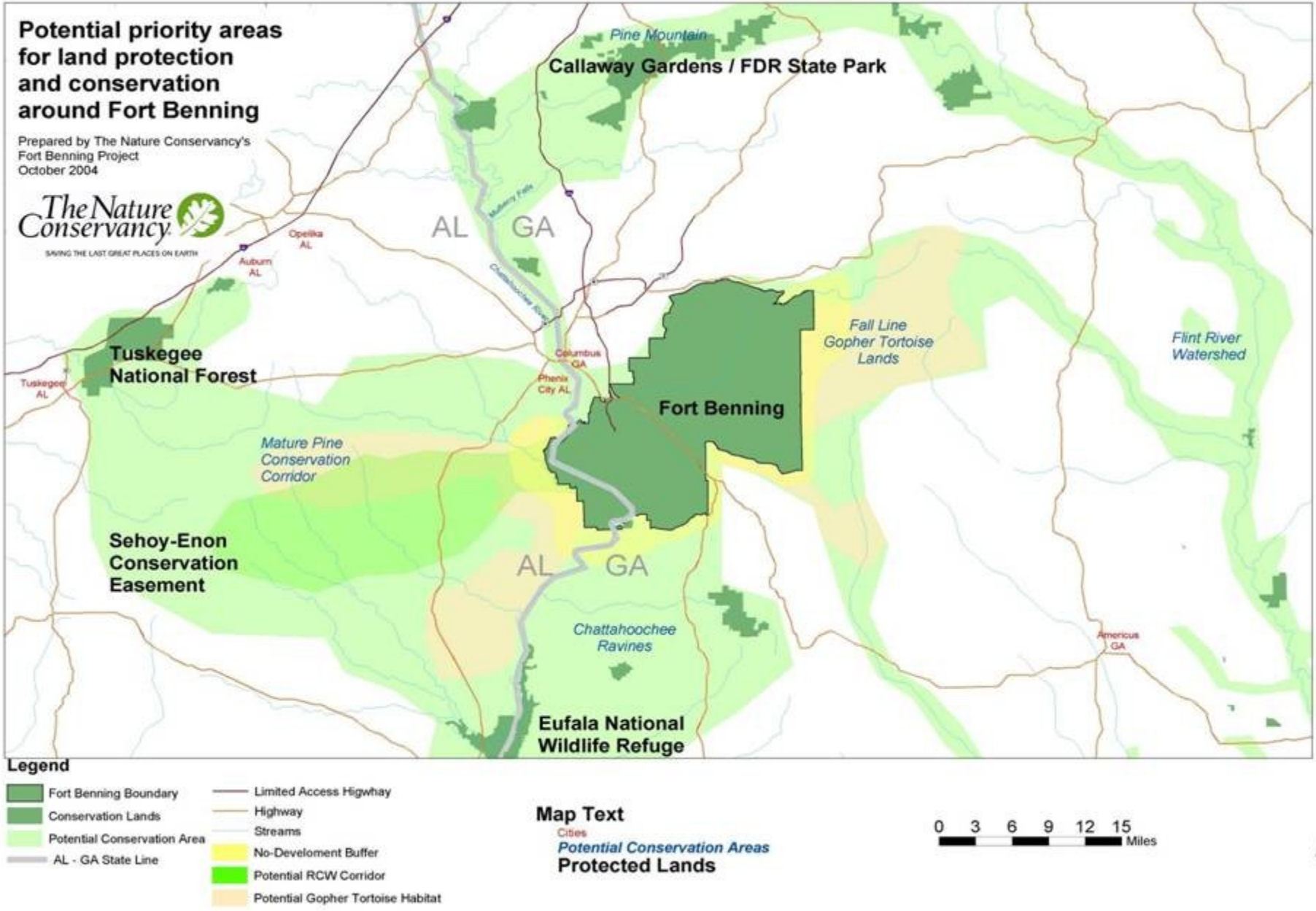
- **Legislative authorities & actions**
- **Relevant national, regional and local data sources**
- **Case studies, lessons learned from partnering actions**
- **Expert resources**
- **Mitigation guidance**
- **Programs (JLUS, etc)**

Installation Community Partnering

http://ff.cecer.army.mil/ponds/home.htm

Regional Assessments

- Numerous approaches underway by different parties
- Drivers include:
  - Base perimeter land conservation (ACUB, etc)
  - Regional habitat partnering (ACUB, other)
  - Regional transportation and other resource issues
  - Resource constraints and competition (SSA)
  - Base sustainability planning (SSA)
  - Expansion of Military Resource Use Space (NIA)
  - Expansion of Military Land Requirements (Army)


Potential priority areas for land protection and conservation around Fort Benning
Prepared by The Nature Conservancy's Fort Benning Project
October 2004
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH
Pine Mountain
Callaway Gardens / FDR State Park
AL
GA
Opelika AL
Auburn AL
Tuskegee National Forest
Tuskegee AL
Columbus GA
Phenix City AL
Fort Benning
Fall Line Gopher Tortoise Lands
Flint River Watershed
Mature Pine Conservation Corridor
Sehoy-Enon Conservation Easement
AL
GA
Chattahoochee Ravines
Americus GA
Eufala National Wildlife Refuge
Legend
Fort Benning Boundary
Conservation Lands
Potential Conservation Area
AL - GA State Line
Limited Access Higwhay
Highway
Streams
No-Develoment Buffer
Potential RCW Corridor
Potential Gopher Tortoise Habitat
Map Text
Cities
Potential Conservation Areas
Protected Lands
0 3 6 9 12 15
Miles
N

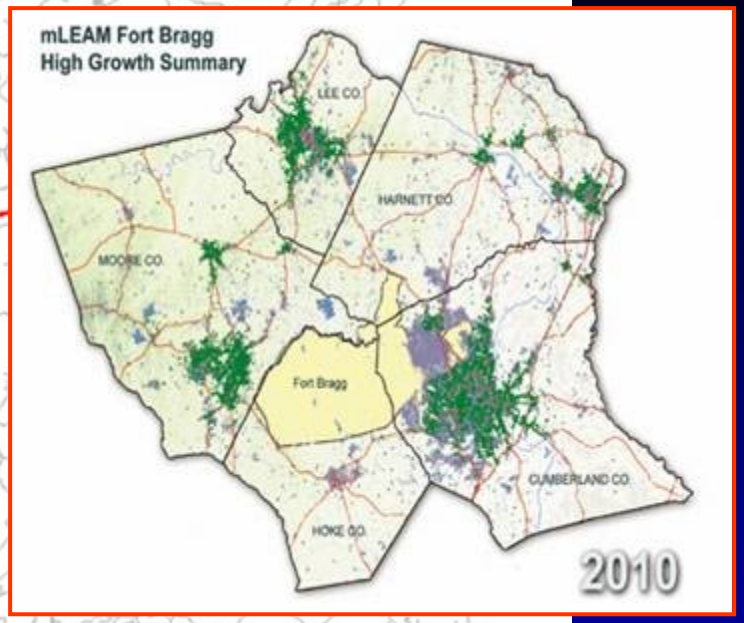
Proposed Highway Route At Bragg

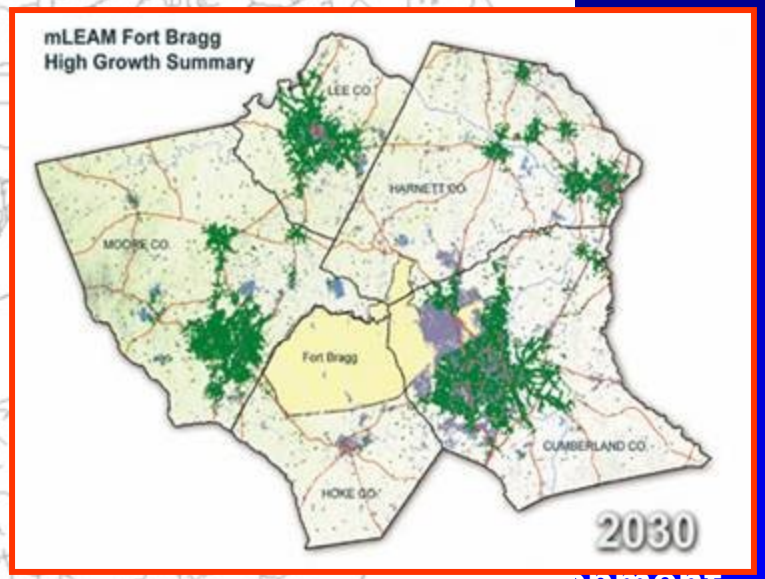
Proposed Highway

Ft Bragg

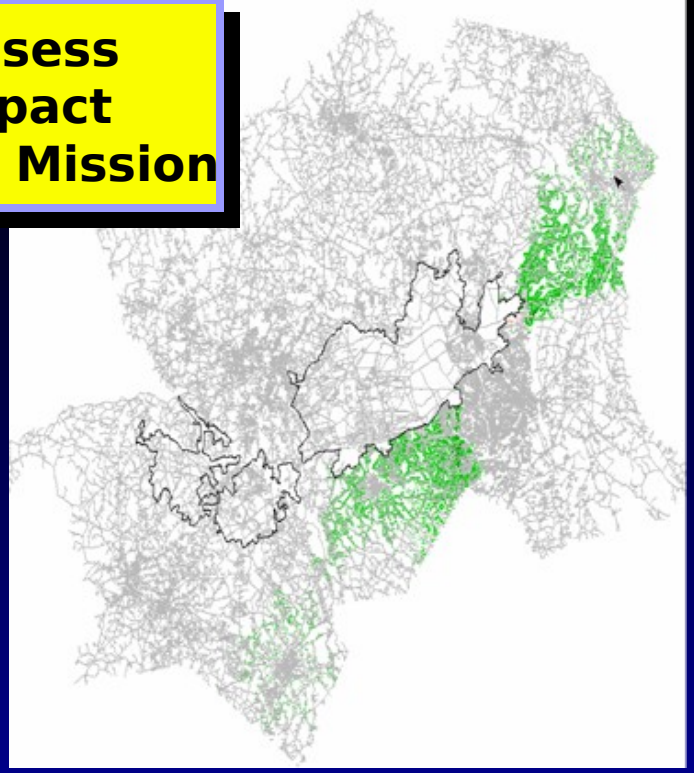
Fayettevi lle

Assess Impact to the Mission



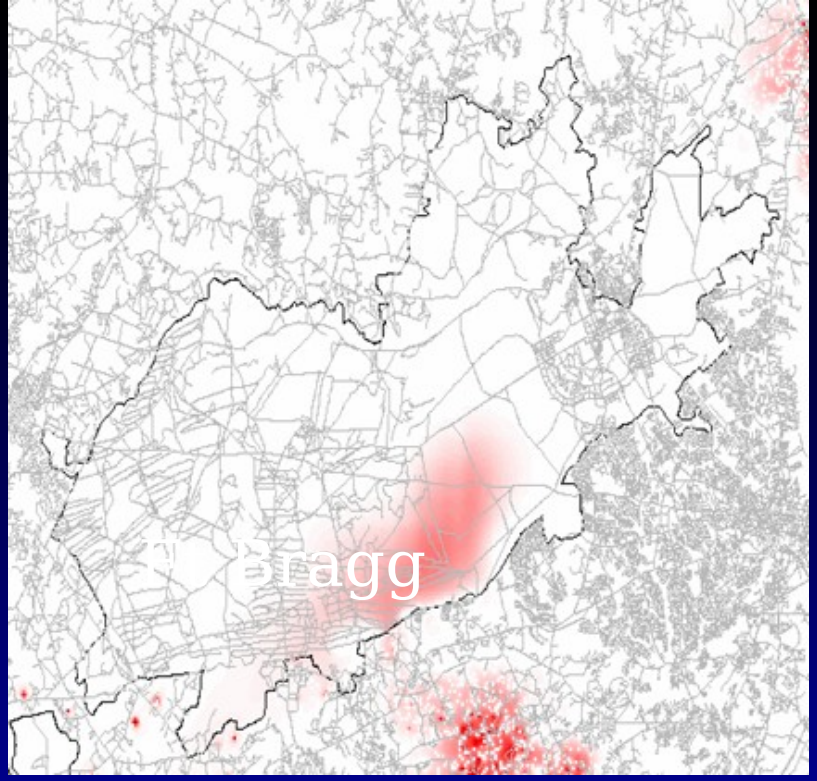


Assess Impact to the Mission



Difference in 30-year Residential

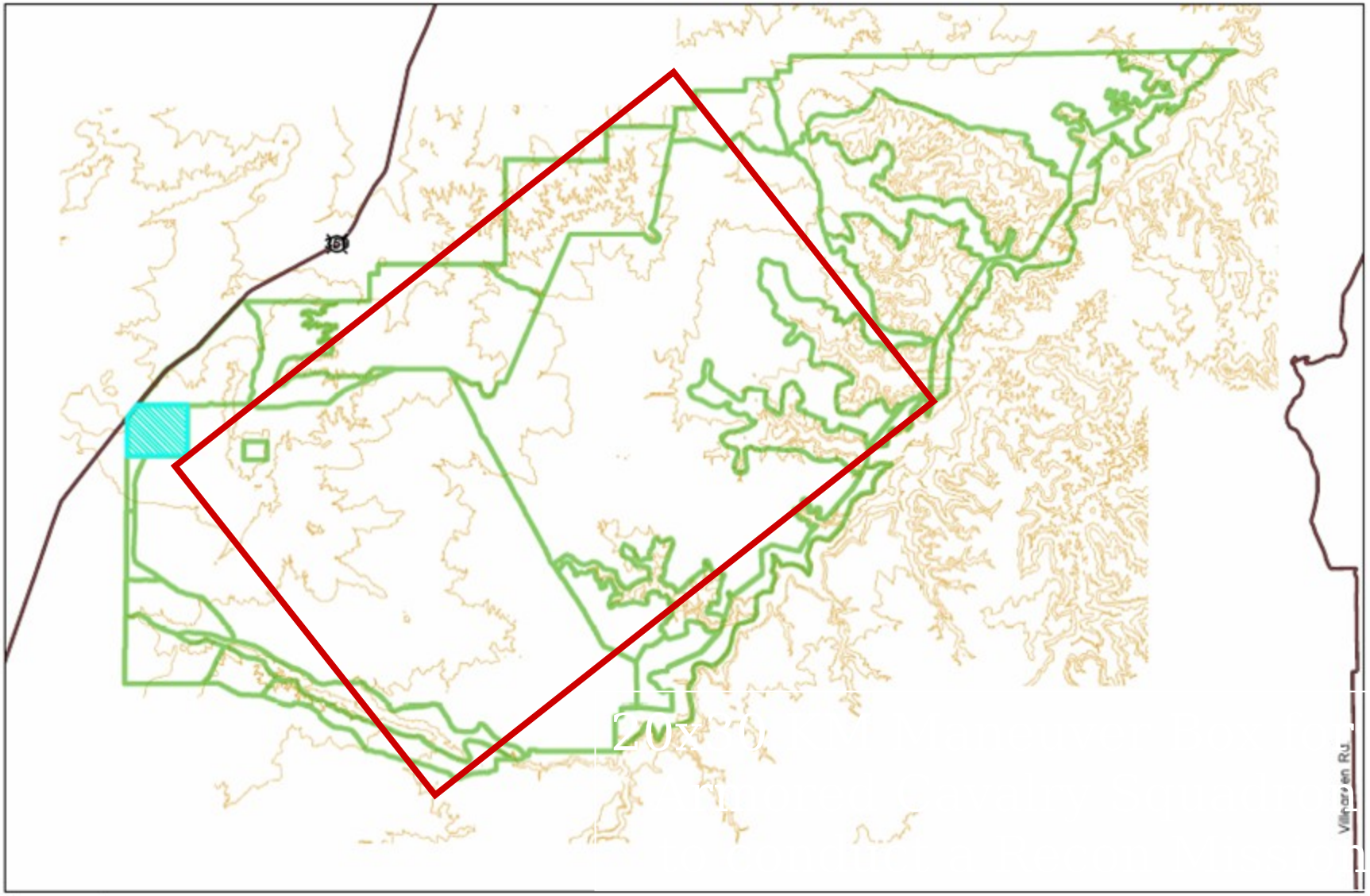
Residential attractiveness and population projections are combined to generate urban growth patterns. This map shows the difference in patterns - with and without the highway. Green areas show “extra growth” due to the road.



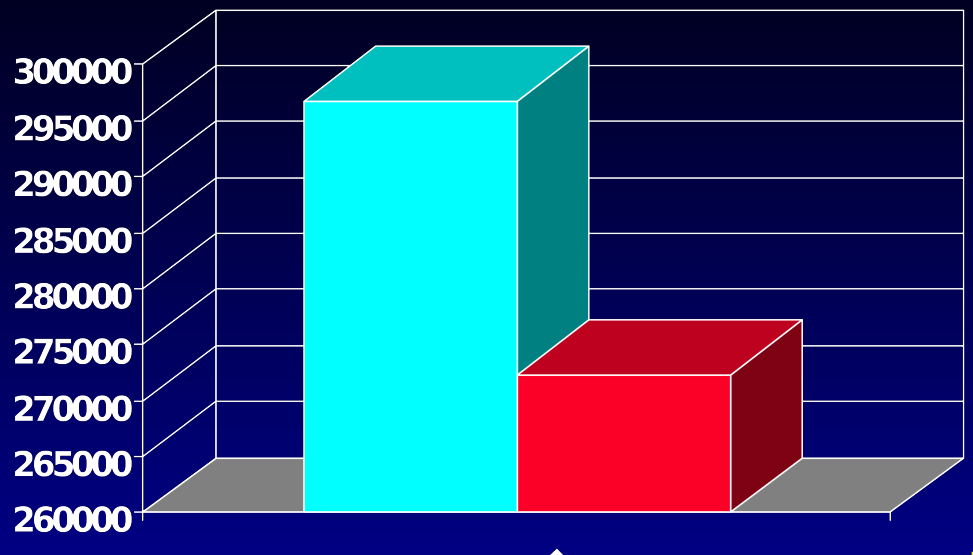
Difference in Blast Noise Tolerance

Finally, preliminary analysis of noise tolerance suggests that the extra growth will decrease the tolerance of noise coming from the areas in red. The darkest red suggests a 5% increase in complaint probabilities.

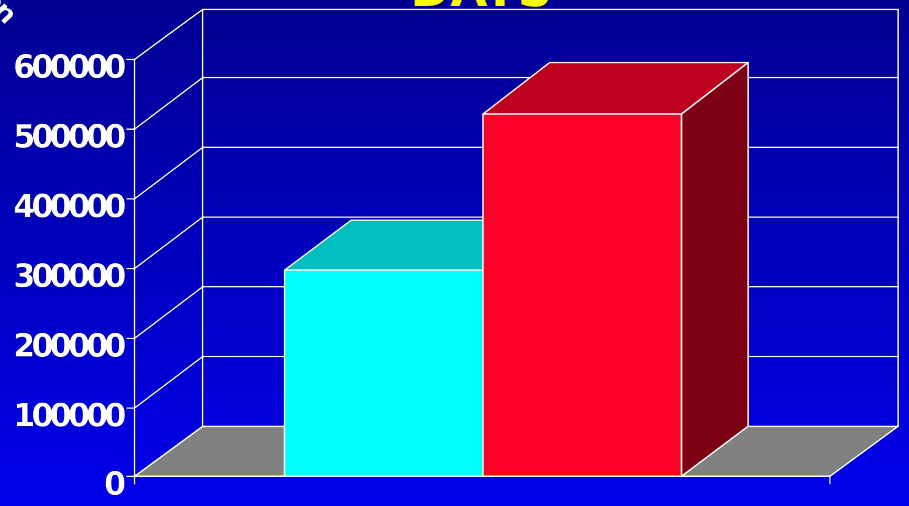
Pinon Canyon, Colorado



CURRENT ANNUAL KM2-DAYS



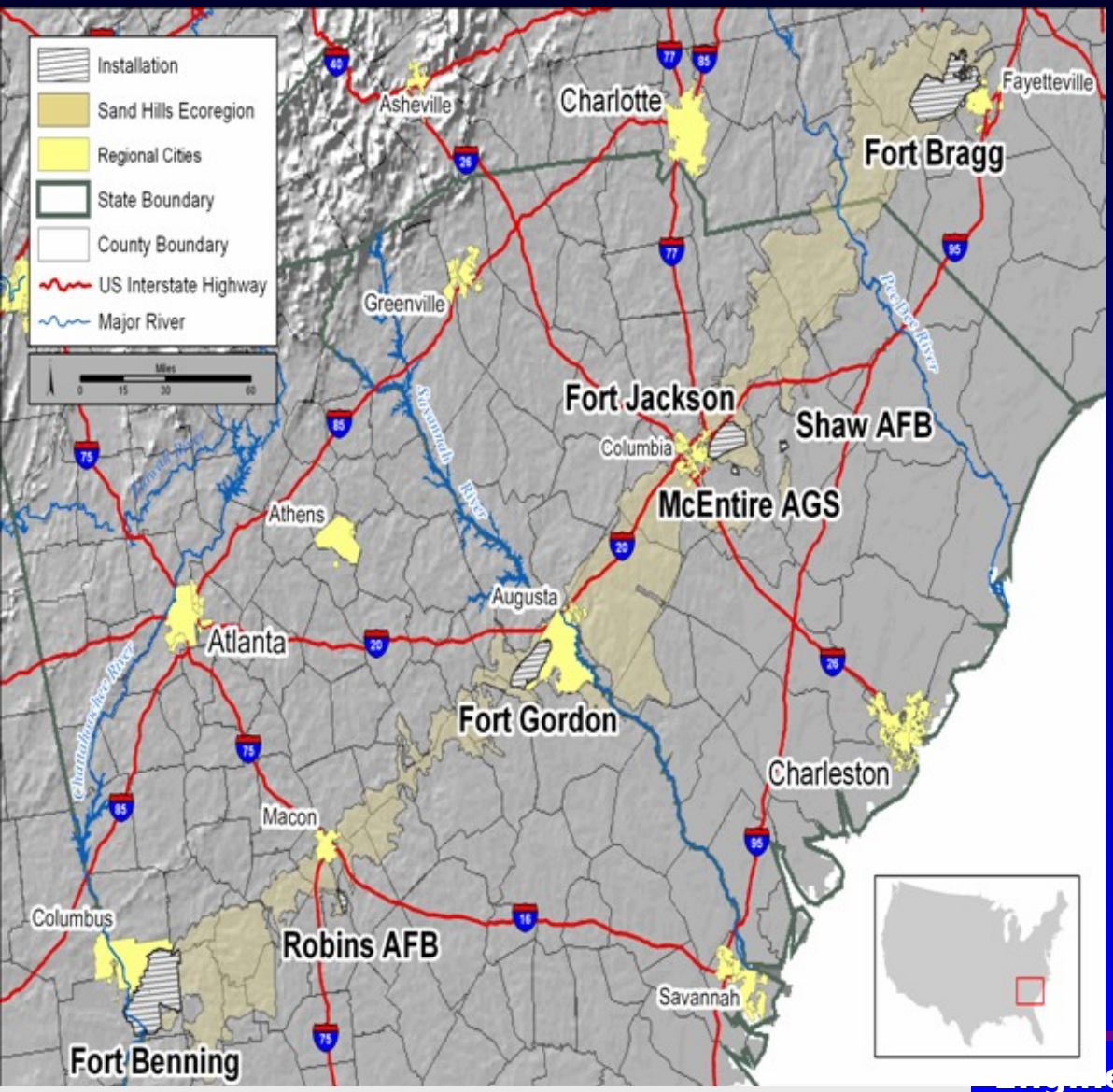
FUTURE ANNUAL KM2-DAYS



Capacity

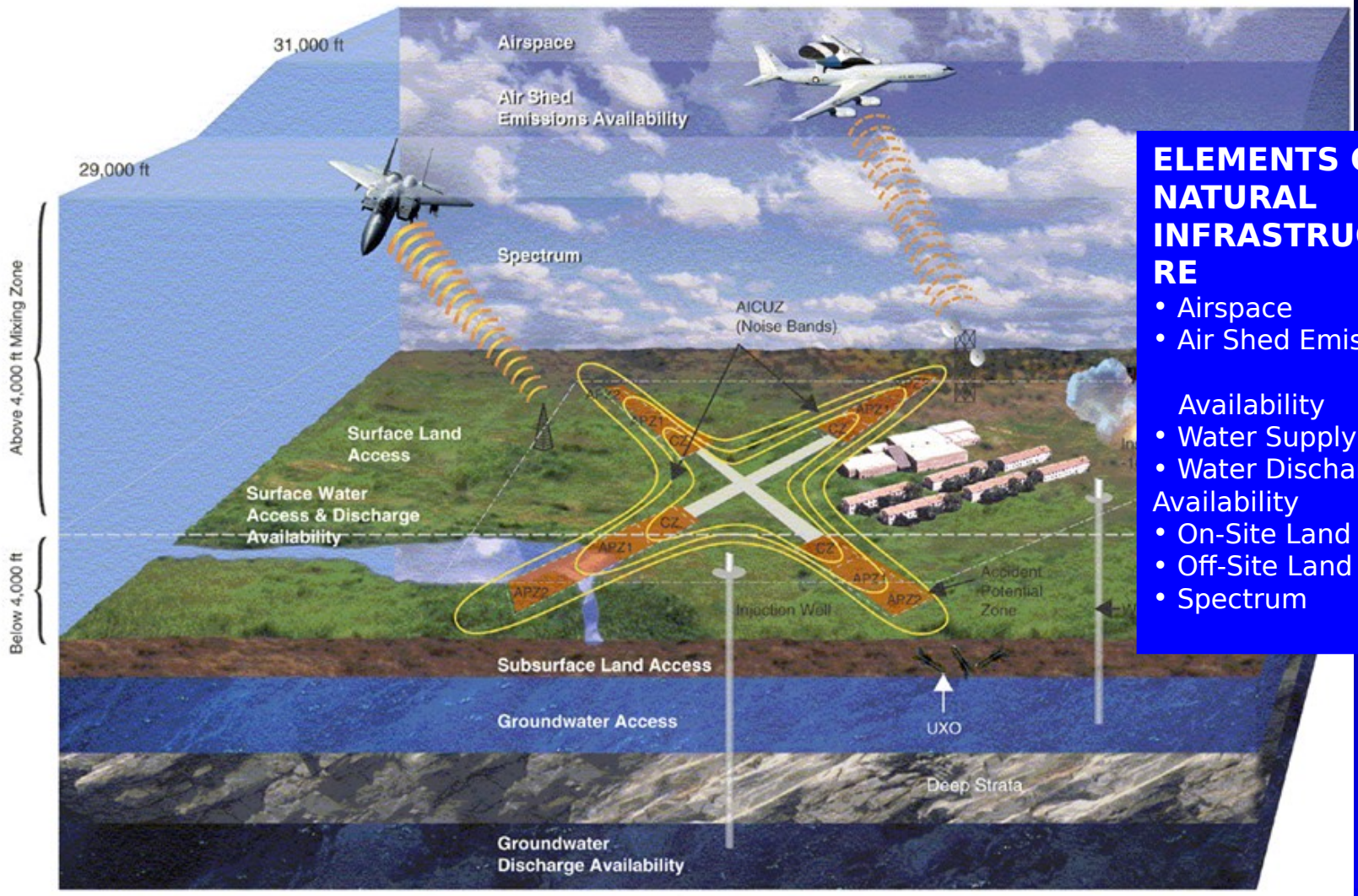
Requirement

Strategic Sustainability Assessment



- **Army Environmental Policy Institute (AEPI) Demonstration Project**
- **Forecast and Backcast sustainability goals of Fall Line bases**
- **Identify emerging resource problems**

Schematic of Natural Infrastructure: Base- or Range-Specific Example

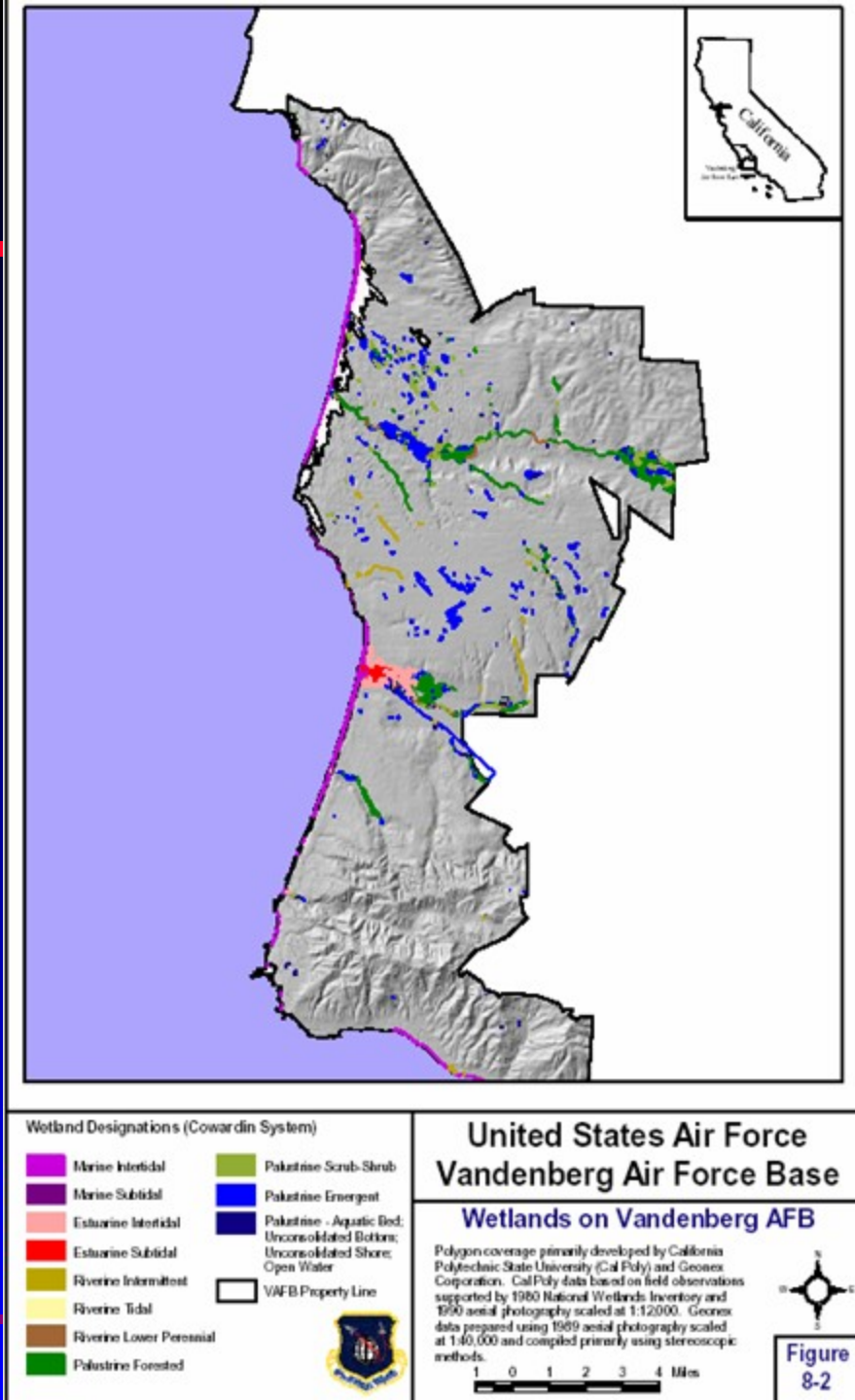


ELEMENTS OF NATURAL INFRASTRUCTURE

- Airspace
- Air Shed Emissions Availability
- Water Supply
- Water Discharge Availability
- On-Site Land
- Off-Site Land
- Spectrum

Wetlands Resource Description

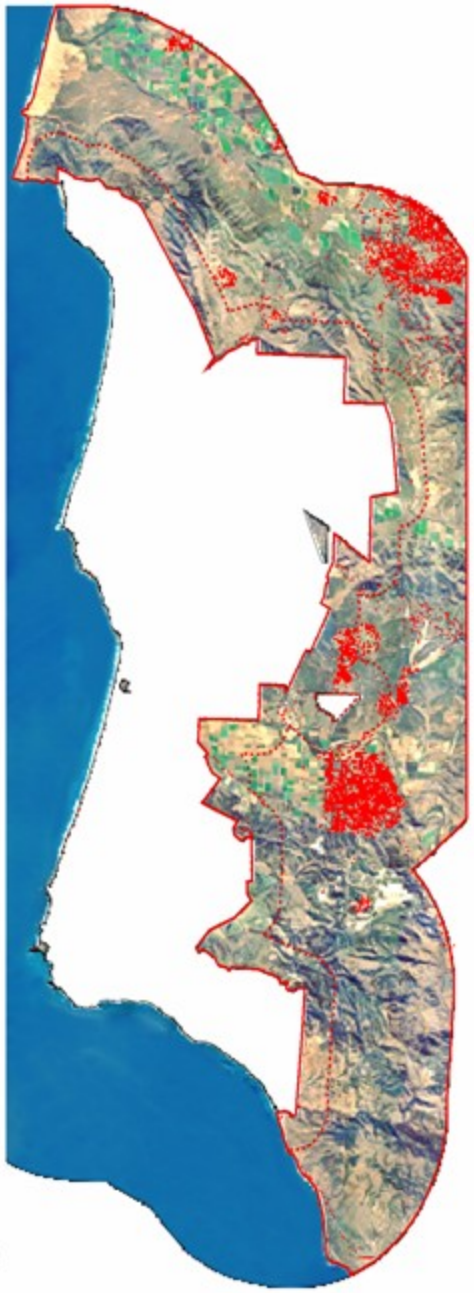
- 5,110 acres of wetlands (5% of total area)
  - Estuarine
  - Riverine aquatic system
  - Lacustrine
  - Palustrine
- Major wetland areas on base include the Barka Slough, the Santa Ynez River, and the Santa Ynez River Estuary.


California
Wetland Designations (Cowardin System)
Marine Intertidal
Marine Subtidal
Estuarine Intertidal
Estuarine Subtidal
Riverine Intermittent
Riverine Tidal
Riverine Lower Perennial
Palustrine Forested
Palustrine Scrub-Shrub
Palustrine Emergent
Palustrine - Aquatic Bed; Unconsolidated Bottom; Unconsolidated Shore; Open Water
VAFB Property Line
United States Air Force
Vandenberg Air Force Base
Wetlands on Vandenberg AFB
Polygon coverage primarily developed by California Polytechnic State University (Cal Poly) and Geonex Corporation. Cal Poly data based on field observations supported by 1980 National Wetlands Inventory and 1990 aerial photography scaled at 1:12000. Geonex data prepared using 1989 aerial photography scaled at 1:40,000 and compiled primarily using stereoscopic methods.
1 0 1 2 3 4 Miles
Figure 8-2

US Army Corps of Engineers

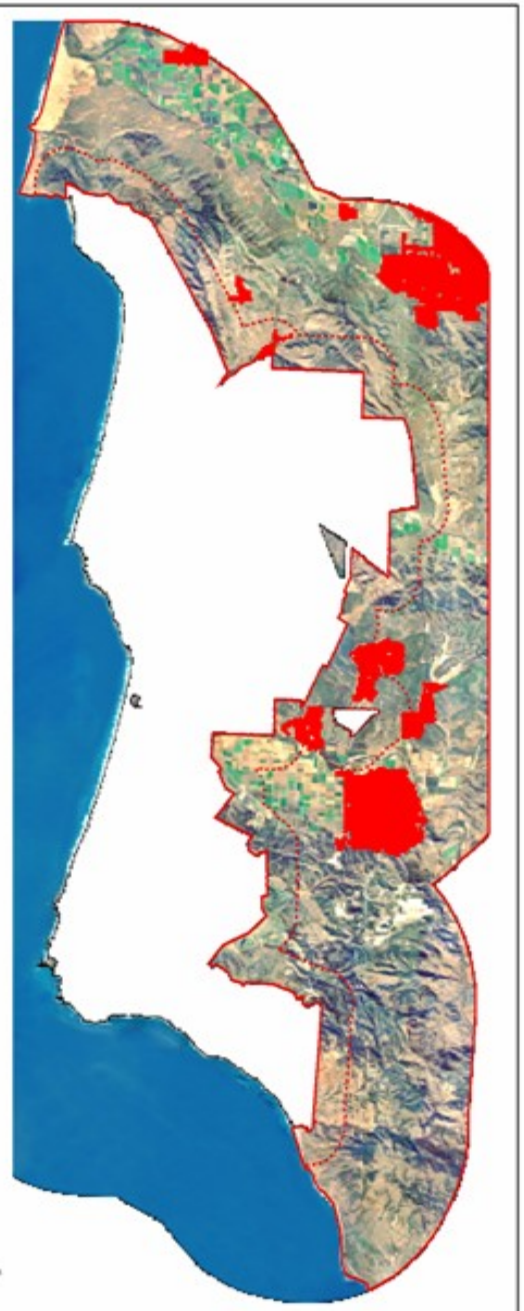
Vandenberg AFB

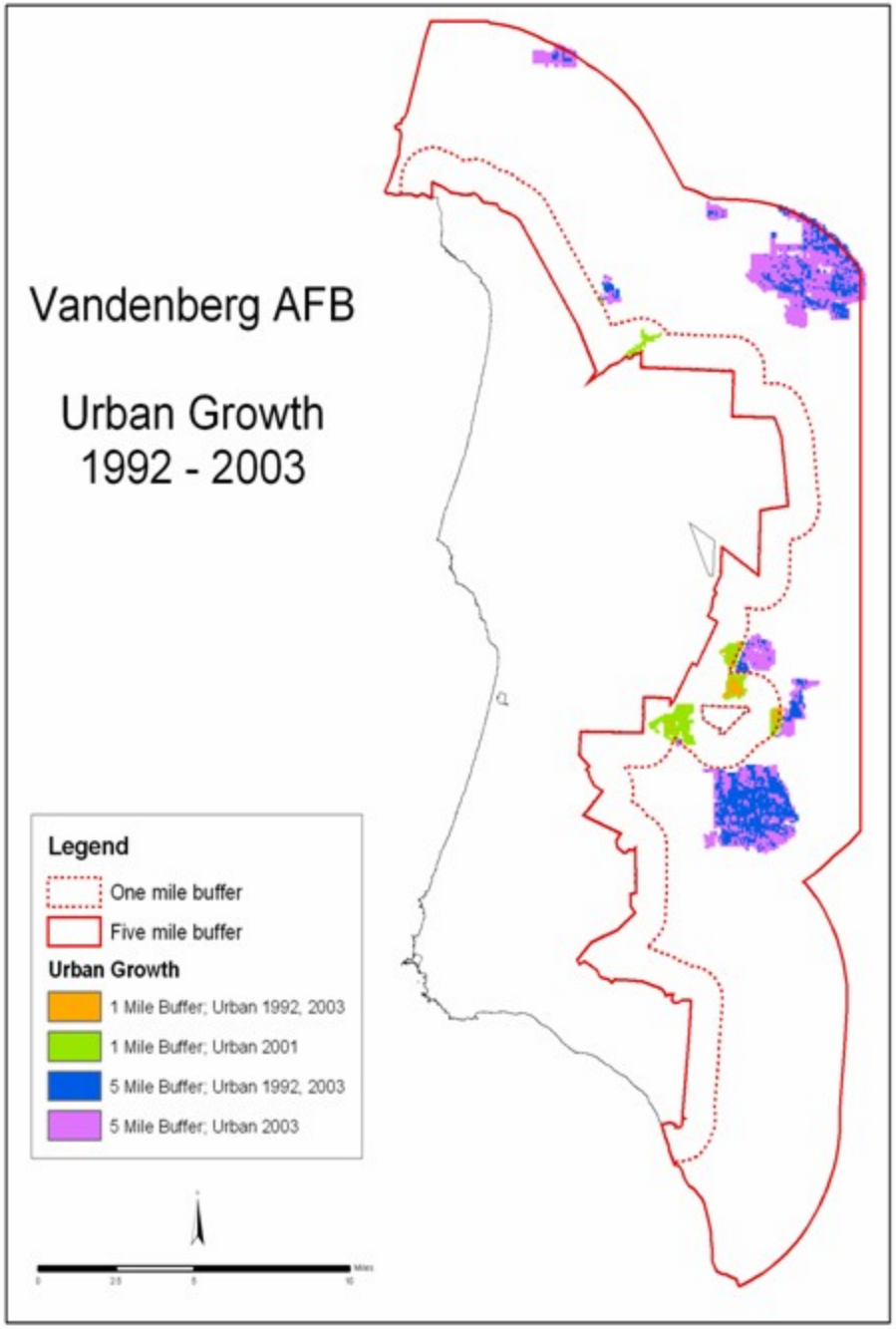
1992 NLCD
Urbanized Areas



Vandenberg AFB

2003 IKONOS
Urbanized Areas





Vandenberg AFB

0-1 Mile Buffer	1-5 Mile Buffer
Urban Areas (% of Buffer) 1992: 6.9% 2003: 16.3%	Urban Areas (% of Buffer) 1992: 35.0% 2003: 54.4%
Change, 1992-2003: + 9.4%	Change, 1992-2003: +19.4%
0.85% Increase / Year (Straight Line)	1.76% Increase / Year (Straight Line)
0.96% Increase / Year (Monomolecular)	3.22% Increase / Year (Monomolecular)
30.8% Urban in 2020 (Straight Line)	84.4% Urban in 2020 (Straight Line)
28.9% Urban in 2020 (Monomolecular)	73.7% Urban in 2020 (Monomolecular)

Joint Regional Distributed Training Capacity

Military Effects Envelope Operations Between Ranges

Purpose:

To ensure that training range resources are capable, available and accessible for evolving military joint training needs.

Products:

- ***Air & land capacity thresholds for distributed training activities that incorporate resource constraints and mission requirements.***
- ***Spatial tools to assess military use capacity at national and local scales over time.***
- ***Environmental trade-off scenario analysis capabilities to optimize current training objectives and sustain future capacity.***
- ***Real-time monitoring of activities to provide feedback to trade-off analysis.***

Payoff:

- ***Enables joint service training planners and range managers to incorporate dynamic regional constraints and capacities into future plans, based upon best-science capacity models.***
- ***Minimizes costly delays in fielding new training systems and doctrine***

Planned Research FY07-10

US Army Corps of Engineers

Engineer Research and Development Center

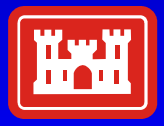
Planning Across The Horizons (PATHs)

Extending the Planning Horizon

- **Within Defense**
  - **OSD**
  - **Service**
  - **Region/Command**
  - **Base**
- **Outside the Fence Line**
  - **Local**
  - **State**
  - **National**

Within Defense

- Programs and processes for collaborative planning (Joint Land Use Studies, Office of Economic Adjustment).
  - Handbook for communities – OEA (2005)
  - Post JLUS framework (still needed)
- Authorities for land partnerships (2003)
- Resources for land partnership actions (2005)
- Lessons learned and legislative information access (partial 2004- more action still needed)
- Pilot projects (Legacy 2004)
- Coordination with other agencies (still needed)



Local Governments Working with Bases

- We have process for collaborative planning (JLUS)
- Process is active with a backlog of requests for JLUS
- JLUS impacts sometimes very helpful, sometimes not enduring
- JLUS studies focus primarily on noise - but need to include other base/community issues – privatization, conservation partnering, buffer land uses, housing and transportation demands, etc.
- Framework for “post JLUS” monitoring and continued coordination needs to be strengthened

Bases Working With Local Governments

- Garrison Commander must give priority to collaborations with local governments
  - Handbook for Commander's (still needed)
  - Active involvement by Commander in community forums
- Community liaison staffing critical
- Base needs to processes to interact with local planning authorities to avoid potential land use conflicts
- Community will regard base as a good partner if:
  - Previous Commander's agreements are honored
  - Plans impacting communities are surfaced early with opportunity for input
  - There is sufficient community involvement from base staff to build familiarity and trust

New Framework for Local Base/Community Interactions

- Most bases are surrounded by numerous local authorities (multiple states, counties, cities, townships, watersheds units, drainage districts, etc)
- Difficult for base to commit resources to achieve sufficient coordination with all these units of government (and non-government stakeholders)
- A council of governments that relates to the base could, in many cases, help facilitate coordinated planning
  - Could be tied to JLUS process (e.g. one outcome of JLUS is to form a council to continue to shape and monitor plans, even after study is completed)
  - BRAC creates Local Reuse Authority. A Local Military Use Authority (designated for a council) could help bring local government and non-government entities together in a framework for enduring coordination).
  - Could be independent from or connected to JLUS

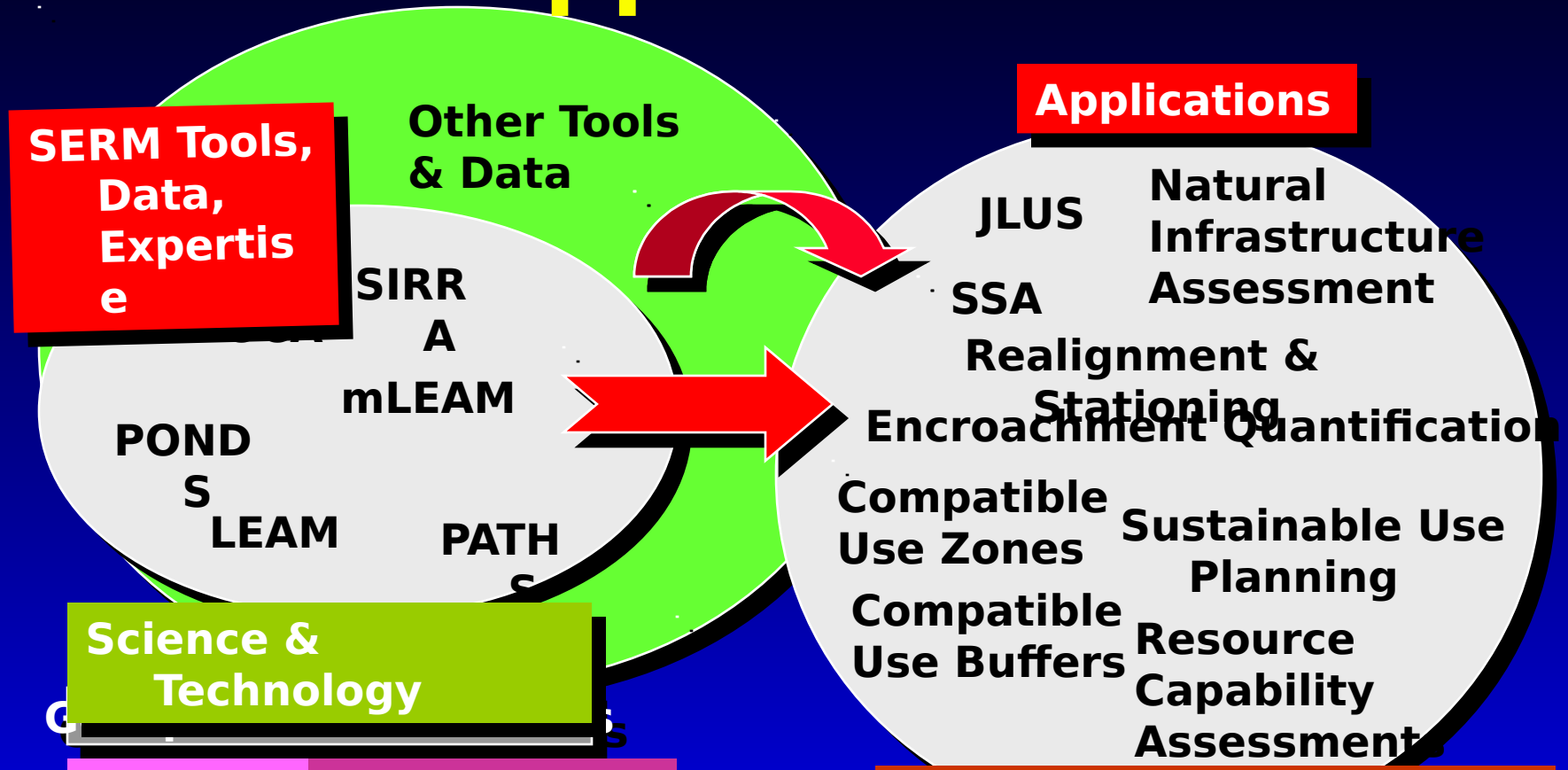
State Facilitating Activities

- Creation and/or proactive use of military affairs committees (units of government)
- Planning requirements for land use actions in the perimeter of bases, ranges and along flight lines
- Resources for collaborative conservation initiatives (such as the Conservation Reserve Enhancement Program)
- Programs and processes (e.g. State Department of Natural Resources, State Department of Transportation) for collaborative land planning with bases
- Assistance to local governments around bases

Federal Facilitating Activities

- Coordination Across Agencies (in Congress, and at agency levels)
  - Defense collaborating with Department of Agriculture on conservation programs focused in buffer areas around bases, ranges and flight paths (using the Conservation Reserve Program –CRP)
  - Defense collaborating with Department of Transportation on highway planning to avoid land use conflicts and to work jointly with States on regional conservation initiatives (e.g. DOT offsets to wetland or endangered species impacts could be linked to regional plans (with local bases) that “bank” resources in strategic locations for bases and other stakeholders

SERM Capability Applications

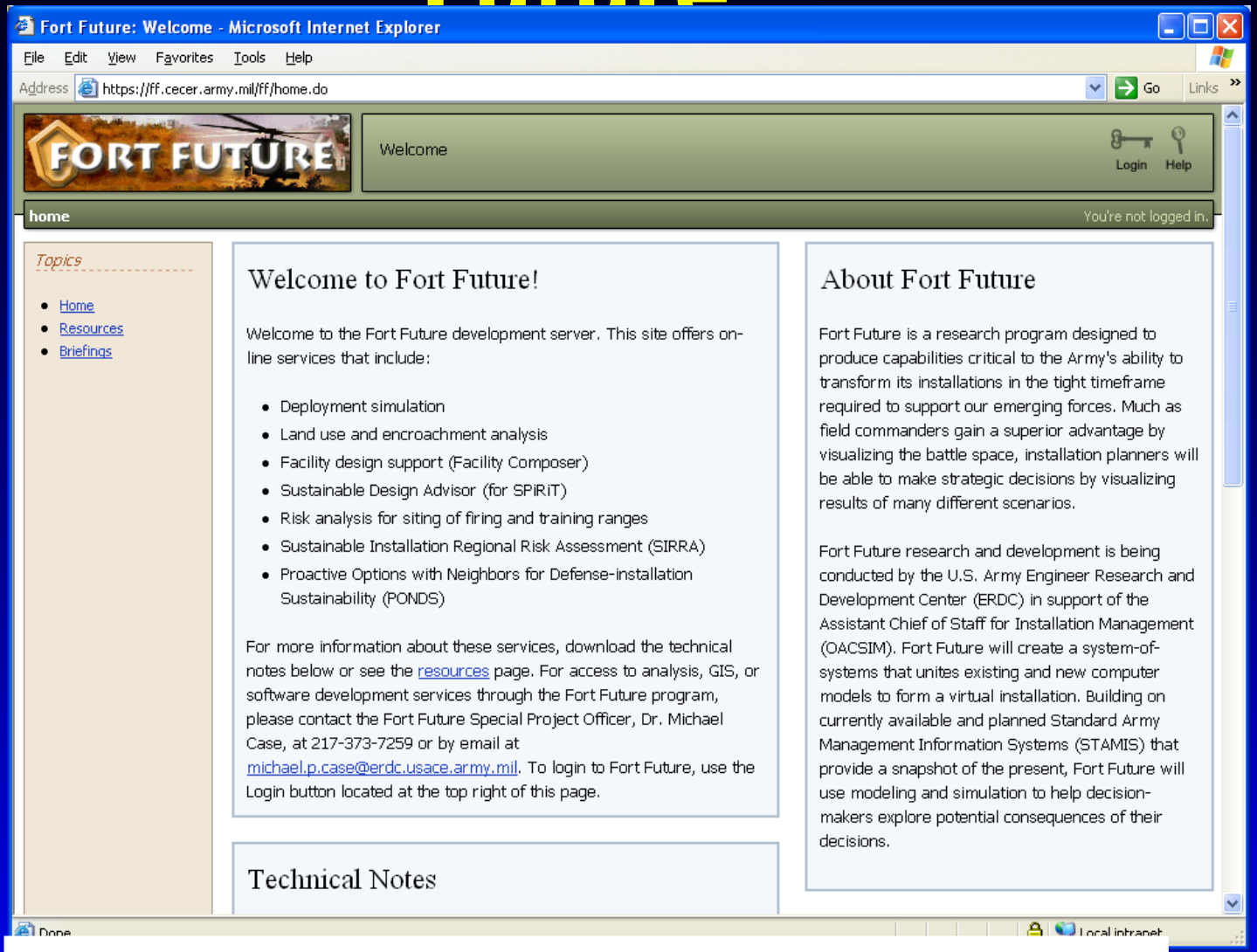


What is Really Important Today?

- Installations need assistance to engage their neighboring communities to protect future training opportunities

- ERDC / CERL has tools and expertise to help you support military installation long range planning

SERM Resources on Fort Future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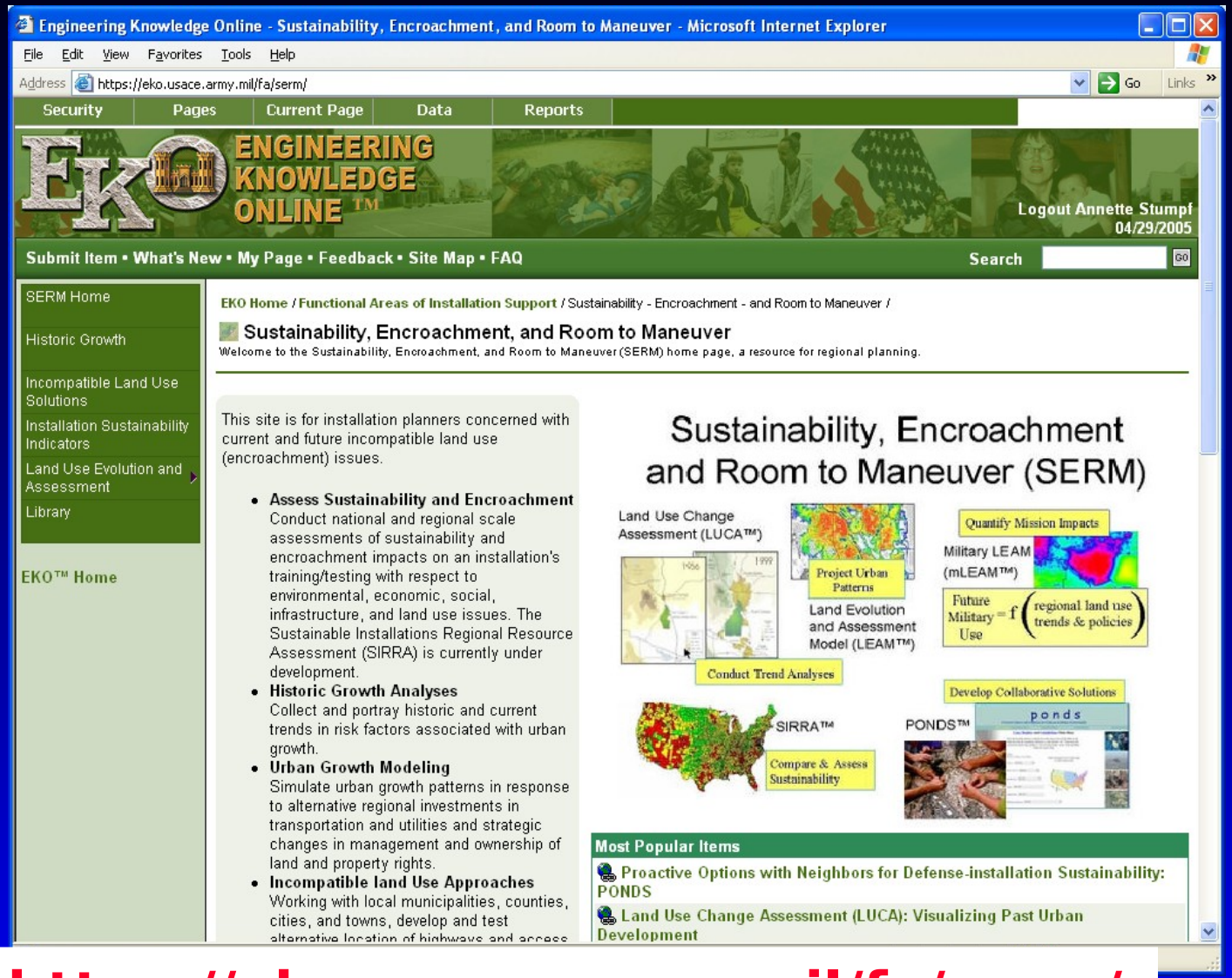
Welcome to Fort Future!
Welcome to the Fort Future development server. This site offers on-line services that include:
Deployment simulation
Land use and encroachment analysis
Facility design support (Facility Composer)
Sustainable Design Advisor (for SPiRiT)
Risk analysis for siting of firing and training ranges
Sustainable Installation Regional Risk Assessment (SIRRA)
Proactive Options with Neighbors for Defense-installation Sustainability (PONDS)
For more information about these services, download the technical notes below or see the resources page. For access to analysis, GIS, or software development services through the Fort Future program, please contact the Fort Future Special Project Officer, Dr. Michael Case, at 217-373-7259 or by email at michael.p.case@erdc.usace.army.mil. To login to Fort Future, use the Login button located at the top right of this page.
About Fort Future
Fort Future is a research program designed to produce capabilities critical to the Army's ability to transform its installations in the tight timeframe required to support our emerging forces. Much as field commanders gain a superior advantage by visualizing the battle space, installation planners will be able to make strategic decisions by visualizing results of many different scenarios.
Fort Future research and development is being conducted by the U.S. Army Engineer Research and Development Center (ERDC) in support of the Assistant Chief of Staff for Installation Management (OACSIM). Fort Future will create a system-of-systems that unites existing and new computer models to form a virtual installation. Building on currently available and planned Standard Army Management Information Systems (STAMIS) that provide a snapshot of the present, Fort Future will use modeling and simulation to help decision-makers explore potential consequences of their decisions.
Technical Notes
Done
Local intranet

https://ff.cecer.army.mil/ff/home.do

SERM Website on EKO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Sustainability, Encroachment, and Room to Maneuver
Welcome to the Sustainability, Encroachment, and Room to Maneuver (SERM) home page, a resource for regional planning.
This site is for installation planners concerned with current and future incompatible land use (encroachment) issues.
Assess Sustainability and Encroachment
Conduct national and regional scale assessments of sustainability and encroachment impacts on an installation's training/testing with respect to environmental, economic, social, infrastructure, and land use issues. The Sustainable Installations Regional Resource Assessment (SIRRA) is currently under development.
Historic Growth Analyses
Collect and portray historic and current trends in risk factors associated with urban growth.
Urban Growth Modeling
Simulate urban growth patterns in response to alternative regional investments in transportation and utilities and strategic changes in management and ownership of land and property rights.
Incompatible land Use Approaches
Working with local municipalities, counties, cities, and towns, develop and test
Sustainability, Encroachment and Room to Maneuver (SERM)
Land Use Change Assessment (LUCA™)
Project Urban Patterns
Land Evolution and Assessment Model (LEAM™)
Quantify Mission Impacts
Military LEAM (mLEAM™)
Future Military Use = f (regional land use trends & policies)
Conduct Trend Analyses
SIRRA™
Compare & Assess Sustainability
Develop Collaborative Solutions
PONDS™
ponds
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Proactive Options with Neighbors for Defense-installation Sustainability: PONDS
Land Use Change Assessment (LUCA): Visualizing Past Urban Development

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US Army Corps of Engineers

Engineer Research and Development Center